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ABSTRACT

The Regents competency test in science is a survey test of the core process skills and core understandings taken from the 10 blocks of the "Science Syllabus for Middle and Junior High Schools." The life, earth, and physical sciences are covered equally. Questions testing knowledge (recall and recognition), comprehension, application, and the process skills are included. This publication provides information that public and nonpublic schools will need to prepare for the first administration of the test in June of 1988. The information includes: (1) a description of the test; (2) a brief discussion on improving the science 7, 8, and 9 program; (3) comments on the core process skills; (4) a process scheme and program implementation matrix; (5) comments on core concepts and understandings; and (6) core understandings and program implementation checklist for the 10 blocks. These blocks (labeled A through J) are: living systems-organisms; living systems-human systems; living systems-microorganisms; the earth's changing surface; weather and climate; astronomy and aerospace science; energy and motion; energy-sources and issues; and science, technology, and society. (JN)

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Information Bulletin:

Regents Competency Testing Program in Science

A Guide to the Core Process Skills and Content Understandings

SE 046 052

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Foreword

This publication is the result of discussions among and recommendations from many science educators at the middle/junior high school and college/university levels. The core process skills and content understandings for the Regents competency test in science presented here were recommended by a Middle/Junior High School Science Advisory Committee, composed of the following members:

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The Regents Competency Test in Science

As part of the Regents Action Plan to Improve Elementary and Secondary Education Results in New York State, the Regents Competency Testing Program is being expanded to include tests in science and in social studies. The first administration of the Regents competency test in science is scheduled for June 1988. Thereafter, it will be given three times a year: in January, June, and August. The earliest opportunity for a student to take the test will be at the end of grade 9. Beginning with the class of 1991, i.e., those students first entering grade 9 in 1987, a student must demonstrate competency in science, by passing either the Regents competency test in science or a Regents examination in science, to receive a high school diploma.

The Regents competency test in science will be a survey test of the core process skills and core understandings taken from the ten blocks of the Science Syllabus for Middle and Junior High Schools. The life, earth, and physical sciences will be covered equally. Questions testing knowledge (recall and recognition), comprehension, application, and the process skills will be included. Information on the format of the test and sample questions will be provided for teachers prior to the initial test administration in June 1988.

The Science 7, 8, and 9 Program

Each school or school district is responsible for establishing its own science 7, 8, and 9 program. Individual schools may follow different instructional sequences in these grades, but should ensure that all students have acquired the appropriate skills and understandings by the completion of ninth grade. Learning outcomes should be set for each grade, and instructional topics and support activities should be planned and implemented.

A district's science 7, 8, and 9 program should build on the student's elementary science experience by providing additional reinforcement for the positive science attitudes the student has acquired in elementary school science and by continuing to use problem-solving as the focus of instructional activities. Concentration on skills, understandings, attitudes, and problem-solving will provide a solid foundation for further science study in high school.

Improving the Science 7, 8, and 9 Program

Since the Regents competency test in science will be based on three years of science instruction, that instruction must be carefully articulated and coordinated. Students should receive balanced instruction in the life, physical, and earth sciences and in the science process skills. The instructional sequence may vary from school to school -- a single discipline may be offered at each grade, or a spiral approach or unified science may be offered across grades -- but students should have studied and reviewed all three disciplines by the end of grade 9.

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A student's science program in grades 7, 8, and 9 should include opportunities to acquire:

- the core science process skills
- the core concepts and understandings from the life, physical, and earth sciences
- the ability to apply the core concepts and understandings to the everyday world.

Answers to the following questions may help in assessing a district's science program.

1. Does the program include a variety of manipulative activities that provide students with concrete experiences appropriate for their level of reasoning ability?

2. Is there ample opportunity for students to apply these concrete experiences to new situations?

3. Does the program supplement these concrete experiences with a variety of instructional activities that utilize textbooks, library research, homework problems, field trips, guest speakers, audiovisual materials, computers, and other learning aids?

4. Does the program capitalize on the unique nature of the early adolescent by helping students to experience the excitement of science? (Exploring the natural world can be and should be fun.)

5. Does the program provide experiences that encourage students to continue in science beyond the mandated second year of science?

6. Are all students, and especially female and minority students, consistently encouraged within the program?

7. Are transfer students assessed and provided instruction in areas they may not have covered in their previous schools, but which will be included on the Regents competency test in science?

Help in developing or improving local science programs is available in Appendix I of the New York State Elementary Science Syllabus (1985) and Curriculum Development: A Handbook for School Districts (1982). Information on problem-solving can be found in Middle/Junior High School Science Block J: Science, Technology, and Society (1985) and in the Elementary Science Syllabus; information on science attitudes can be found in the latter publication. Information on process skills and the process scheme can be found in the publication Reflections on Writing in Science (1984). These publications are available from the Bureau of Curriculum Development, New York State Education Department, Albany, New York 12234.

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The Core Process Skills

The Regents competency test in science will evaluate student mastery of science process skills. Each block of the Science Syllabus for Middle and Junior High Schools lists 23 process skills used in science. This skills list has been reorganized using a scheme adapted from Fuhrman, Lunetta, Novick, and Tamir.* The process scheme builds on and organizes at a higher level the skills described in the elementary science syllabus. It provides direction for the use of manipulative activities.

The following points should be noted when referring to the process scheme:

1. The process skills from the list of 23 in each syllabus block have been matched to the process scheme as indicated by the number in parentheses following the appropriate elements of the process scheme.

2. **Those elements of the process scheme which appear in boldface type are core skills. Only core skills will be tested on the Regents competency test in science.**

3. Test questions relating to the core process skills will be simple and uncomplicated. Students will not be expected to apply these process skills in a sophisticated manner.

4. An implementation matrix accompanies the process scheme so that program activities may be correlated by grade to the process scheme. Such a correlation should help ensure that students are receiving instruction in each of the core skills.

5. Students will be expected to master each core component of the process scheme, but will not be expected to generate the process scheme from memory. As a result, individual activities listed in the implementation matrix may include only two or three components of the process scheme. However, the total science 7, 8, and 9 program should provide an appropriate mix of all the core components.

* M. Fuhrman, V. Lunetta, S. Novick, and P. Tamir, The Laboratory Structure and Task Analysis Inventory (LAI): A User's Handbook, Technical Report 14, The University of Iowa, Science Education Center, Iowa City, Iowa, 1978. Used with permission. (The Laboratory Analysis Inventory also appeared in V. Lunetta and P. Tamir, "Matching Lab Activities with Teaching Goals," The Science Teacher, May, 1979.)

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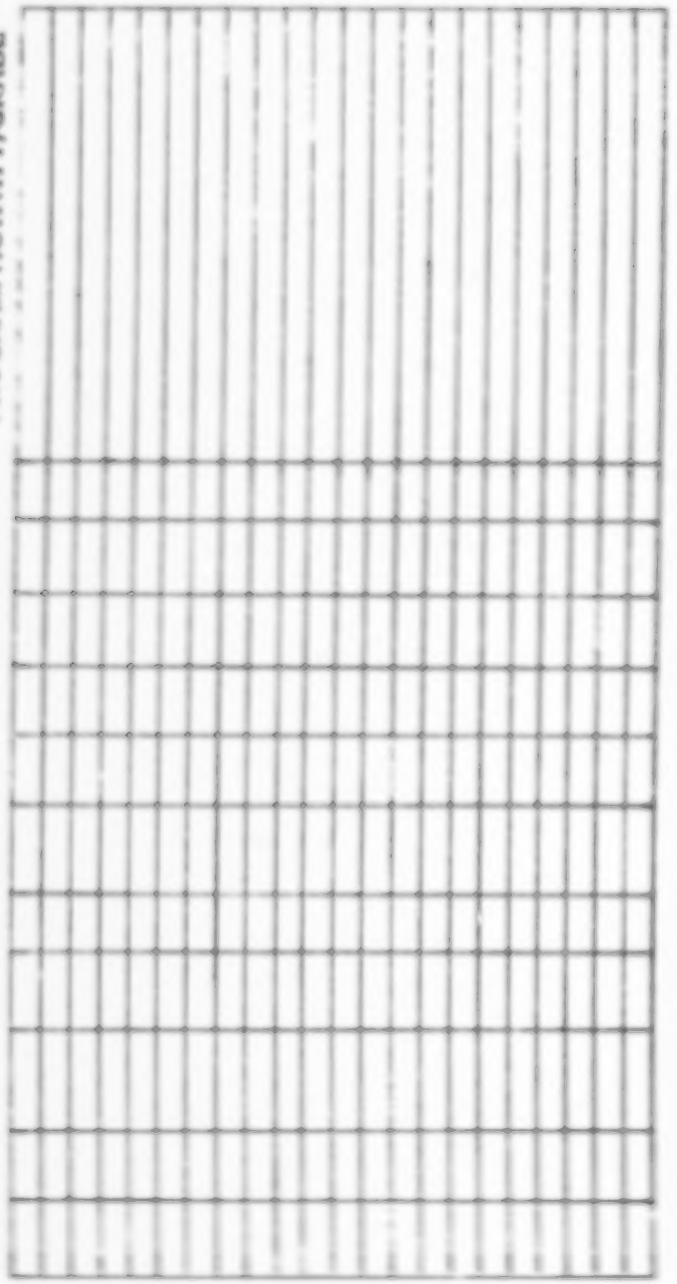
Process Scheme and Program Implementation Matrix



1.0 Planning and Design

1.1 Formulates a question or defines a problem to be investigated (8)

1.2 Predicts an experimental result (9) *

1.3 Formulates a hypothesis to be tested in an investigation (9)

1.4 Designs an observation or measurement procedure (3)

1.5 Designs a controlled experiment (10, 11)

2.0 Performance

2.1a Carries out a qualitative observation (1, 7)

2.1b Carries out a quantitative observation or measurement (1, 5, 7)

2.2 Manipulates apparatus safely; develops technique (4, 6)

2.3 Records results; describes observations (2)

* Boldface type indicates the core process skills which will be tested on the Regents competency test in science.

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2.4 Performs numeric calculations

2.5 Explains or makes a decision about experimental technique

2.6 Works according to own design

3.0 Analysis, Interpretation, and Application

3.1a Transforms results into a standard form (other than graphs), such as a data table where the form is given (12, 13)

3.1b Graphs data, given numbered axes (12, 13)

3.2a Determines a qualitative relationship (13, 14)

3.2b Determines a quantitative relationship (13, 14, 15)

3.3 Determines accuracy of experimental data (16)

3.4 Defines or discusses limitations and/or assumptions that underlie the experiment (16, 22)

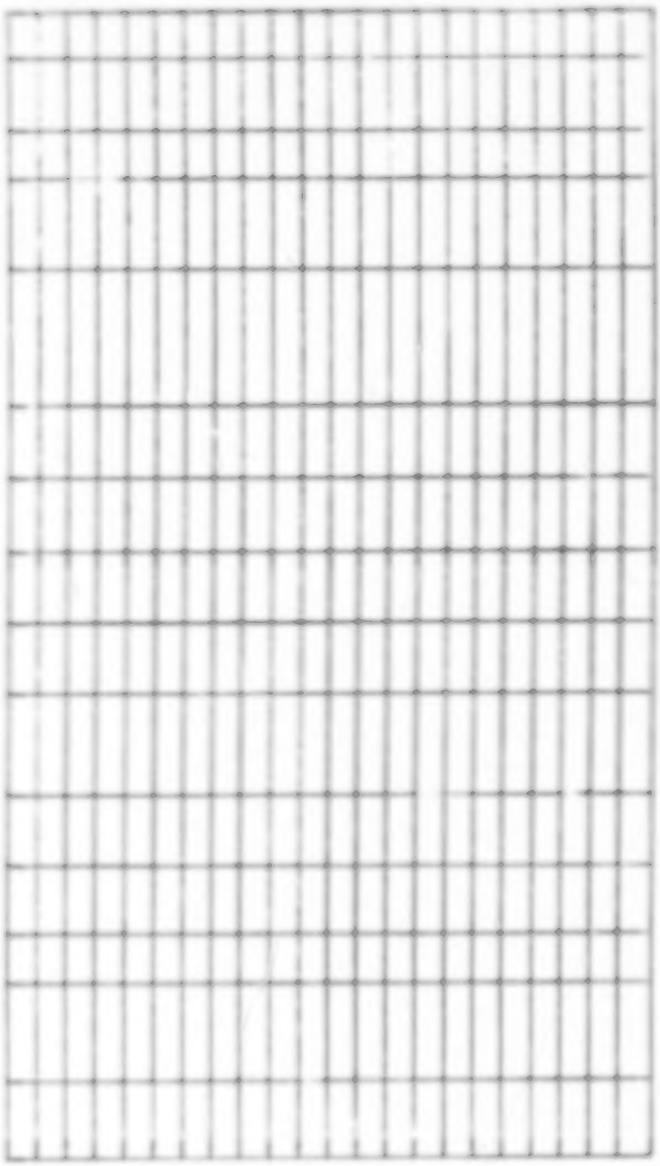
3.5 Formulates or proposes a generalization or model (17, 18, 19)

3.6a Interprets data in graphs, tables, and diagrams (14)

3.6b Explains a relationship (17, 20)

3.7 Formulates new questions or defines a new problem based on the results of the investigation

3.8 Predicts based on the results of the investigation (9)



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The Core Concepts and Understandings

The core concepts and understandings listed on the next several pages are the content basis for the Regents competency test in science. Students should have mastered these core understandings, as well as the core process skills, by the time they take the Regents competency test in science. The following points should be noted in reference to the core understandings:

1. Students will be evaluated on their mastery of the core understandings and on their ability to apply these understandings to the practical, everyday world.

2. The core understandings listed in the "Core Understanding" column are derived from Blocks A through J of the Science Syllabus for Middle and Junior High Schools.

3. Each core understanding should be viewed as a "terminal" outcome for the student.

4. The supporting understandings referred to in the "Supporting Understandings" column should be viewed as additional understandings that may help the student master the core understanding.

5. An implementation checklist accompanies the list of core understandings so that schools can correlate their science programs by grade to the understandings to determine if students are receiving instruction in all the core understandings.

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
		BLOCK A LIVING SYSTEMS: ORGANISMS				
5	A1	Living things are in constant contact with their environment and they continually exchange materials with the environment.	p. 5-8, sections I A and I A 1-8	___	___	___
6	A2	All living things require energy and material input such as food for growth and repair.	p. 6, I A 2	___	___	___
6	A3	Green plants are producers which use light energy, carbon dioxide, and water as they produce food and oxygen during the process of photosynthesis.	p. 6-7, I A 3 p. 16, II A and II A 1	___	___	___
6	A4	All living things, including plants, must release energy from their food (respiration) as they carry on their life activities. During respiration, most living things use oxygen and release carbon dioxide as a waste product.	p. 6-7, I A 3	___	___	___
7	A5	Almost always, energy is supplied initially to an ecosystem or the food chain by the activities of green plants. Other organisms use the energy produced by green plants.	p. 6-7, I A 3	___	___	___
7	A6	Water is essential to life and is provided by the environment.	p. 7, I A 4	___	___	___
8	A7	All living things respond to stimuli in their environment.	p. 8, I A 6	___	___	___
8	A8	Some living things remain dormant or hibernate during extremes of environmental factors. Others migrate and thus avoid environmental extremes.	p. 7-8, I A 5	___	___	___
8	A9	Reproduction provides for the continuation of life by producing new individuals.	p. 8, I A 7	___	___	___
8	A10	Survival of an organism depends upon its ability to adjust to its environment.	p. 8-9, I B	___	___	___
8	A11	Each kind of organism is adapted for survival under a given set of conditions, such as arctic or desert conditions, or life in water, soil, or air.	p. 8-11, I B and I B 1-2	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
16	A12	Living things are interdependent with one another and with their environment.	p. 16-21, II A (all)	___	___	___
18	A13	Materials from dead and decaying plants and animals are recycled through the ecosystem, providing nutrients to living organisms.	p. 18, II A 1f	___	___	___
19	A14	Fungi and other decomposers cannot produce their own food and thus depend on other living things for food.	p. 19, II A 2	___	___	___
19	A15	Animals are consumers which cannot make their own food and thus depend on green plants for food and oxygen.	p. 19, II A 3	___	___	___
19	A16	Foods are composed of the following nutrient groups: carbohydrates, fats, proteins, minerals, and vitamins.	p. 19-21, II A 3a	___	___	___
21	A17	All living things come from other living things.	p. 21-26, II B (all)	___	___	___
26	A18	The life cycle of an organism is the series of changes it goes through in its own development and in reproducing its kind.	p. 26-27, II C (all)	___	___	___
28	A19	All organisms interacting in any given area form a natural community.	p. 28-29, III, III A, and III A 1a	___	___	___
29	A20	Natural communities change in an orderly, predictable sequence of events. Over time, one community can be replaced by a quite different community.	p. 29-30, III A 1b	___	___	___
30	A21	The balance present in ecosystems is the result of complex interactions among community members and between community members and their environment.	p. 30-32, III B and III B 1-3	___	___	___
32	A22	Natural balance may be disturbed in various ways, natural and human.	p. 32-33, III B 4 p. 38-39, III D and III D 1-2	___	___	___
33	A23	Soil, plants, and water are renewable resources which humans, through overuse, can deplete.	p. 33-38, III C and III C 1-5	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
38	A24	Minerals are nonrenewable resources which may eventually run out. Many minerals used by humans, however, can be recycled.	p. 38, III C 6	___	___	___
		BLOCK B LIVING SYSTEMS: HUMAN SYSTEMS				
10	B1	The human body is a complex system which is itself composed of a variety of systems. Body systems are interdependent with one another and each contributes to the operation of the system as a whole.	p. 10-32, III (all)	___	___	___
11	B2	Systems of the human body perform certain life functions, such as digestion and circulation.	p. 11-32, III B (all)	___	___	___
11	B3	Cells which act together are organized into tissues, tissues which act together are organized into organs, organs which act together are organized into systems, and systems which act together are organized into a multicellular organism.	p. 10-11, III A (all)	___	___	___
11 13	B4	The skeletal and muscular systems function together to move body parts and to control the locomotion of the body. The skeletal system also supports the organs of the body.	p. 11-14, III B 1-2	___	___	___
11	B5	The skeletal system is composed of the skull, the spinal column, the breastbone and ribs, the bones which form the limbs, and cartilage.	p. 11-13, III B 1	___	___	___
13	B6	The muscular system is composed of voluntary muscles, such as skeletal muscles, and of involuntary muscles, such as intestine and heart muscles.	p. 13-14, III B 2	___	___	___
14 19	B7	The endocrine system and the nervous system function together to coordinate and control body activities.	p. 14-21, III B 3-4	___	___	___
14	B8	The nervous system consists of the brain, parts of the sense organs, and the spinal, sensory, and motor nerves and neurons.	p. 14-19, III B 3	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
19	B9	The endocrine system consists of the hormone-secreting glands.	p. 19-21, III B 4	___	___	___
21	B10	The digestive system breaks down food physically and chemically. Digested food is absorbed into the circulatory system.	p. 21-23, III B 5	___	___	___
21	B11	The digestive system consists of the mouth, esophagus, stomach, and the small and large intestines. The liver and pancreas are accessory organs.	p. 21-23, III B 5	___	___	___
23	B12	Undigested and indigestible materials constitute the body wastes (feces), which move automatically through the large intestine and are eliminated by the body.	p. 22-23, III B 5 b (5)	___	___	___
24	B13	The circulatory system transports digested food, water, and oxygen to the cells of the body, provides for the exchange of these materials between the blood and the body cells, and transports carbon dioxide and other wastes from the cells.	p. 23-27, III B 6	___	___	___
24	B14	The circulatory system consists of the heart, blood, arteries, veins, capillaries, lymph, and lymph vessels.	p. 23-27, III B 6	___	___	___
27	B15	Cellular respiration releases energy from digested food and occurs within the body's cells.	p. 27, III B 7	___	___	___
29	B16	The respiratory system provides for the exchange of respiratory gases (oxygen and carbon dioxide) between the external environment and the body's cells. Exchange of gases occurs in two stages: between the lungs and the blood and between the blood and the body's cells.	p. 27-31, III B 7	___	___	___
27	B17	The respiratory system consists of nose, trachea, bronchi, and lungs.	p. 27-31, III B 7	___	___	___
31	B18	The excretory systems remove wastes from the blood and, eventually, the body.	p. 31-32, III B 8	___	___	___
31	B19	The excretory systems consist of the skin, lungs, kidneys, and liver.	p. 31-32, III B 8	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
31	B20	The kidneys help control the water and mineral balance of the body and eliminate wastes from the blood as urine.	p. 31, III B 8c	___	___	___
-	B21	The reproductive system provides for the formation of offspring.	--	___	___	___
-	B22	The female reproductive system consists of the ovaries, oviducts, uterus, vagina, and mammary glands.	--	___	___	___
-	B23	The male reproductive system consists of the testes, penis, and sperm ducts.	--	___	___	___
		BLOCK C LIVING SYSTEMS: MICROORGANISMS				
5	C1	Every living organism is made up of cells which carry on the basic life functions of the organism.	p. 5-10, II (all)	___	___	___
5	C2	Each cell contains structures that carry on these life functions.	p. 5-7, II A	___	___	___
8	C3	Cell division is necessary for growth, repair, and reproduction.	p. 8-9, II B-C	___	___	___
9	C4	Sexual reproduction leads to the possibility of variation in the next generation.	p. 9, II C	___	___	___
16	C5	Many infectious diseases are caused by microscopic organisms which can be transmitted from one individual to another.	p. 16-21, V A-B	___	___	___
16	C6	Noninfectious diseases are caused by such factors as deficiencies in diet, malfunctioning endocrine glands, allergies to foreign substances, malfunctioning organs, and diseases caused by chemicals introduced into the environment.	p. 16-17, V A 2	___	___	___
22	C7	Many microorganisms are beneficial to other organisms.	p. 22-25, VI (all)	___	___	___
25	C8	To prevent infection, contamination, and spoilage, microorganisms are controlled by removing or killing them, or by inhibiting their growth. Sterilization, disinfection, pasteurization, canning, refrigeration, and freezing are methods of controlling microorganisms.	p. 25-29, VII (all)	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
		BLOCK D THE EARTH'S CHANGING SURFACE				
5	D1	Earth's surface features, which are continually undergoing change, result from interacting processes which either wear away or build up Earth's surface.	p. 5, I A	___	___	___
5	D2	Soil and rock fragments are formed by the breaking down of bedrock. Soil consists of weathered rock fragments that contain organic material.	p. 5, I B p. 16, II A 1e	___	___	___
5 9	D3	Minerals and rocks can be identified by their physical and chemical properties.	p. 5-8, I C p. 9-10, I D	___	___	___
9	D4	The crust of Earth is composed of rocks, which are naturally occurring substances composed of one or more minerals.	p. 9-10, I D	___	___	___
11	D5	The floor of the ocean has major landforms which include mountains, valleys, plains, and plateaus.	p. 10-11, I E	___	___	___
14	D6	The dynamic processes that wear away Earth's surface, including weathering and erosion, are driven largely by the water cycle and the force of gravity. Water, wind, and glaciers move material from the continents into the ocean basins.	p. 14-24, II A (all)	___	___	___
25	D7	Forces within Earth's crust, which originate from crustal plate movement, cause folding and faulting and movements of the crust. They also produce earthquakes, mountains, volcanoes, and, to a lesser extent, plains and plateaus on continents and sea floor. These forces build up Earth's surface.	p. 25-28, II B (all)	___	___	___
29	D8	Fossils and the sedimentary rocks which contain them can be used to infer the development of life, climates of the past, and the environments in which the fossils were formed.	p. 28-32, III (all)	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
		BLOCK E WEATHER AND CLIMATE				
8	E1	Much of our weather is determined by large bodies of air called air masses.	p. 8, I A	___	___	___
9	E2	Air masses form when air stays over a large portion of Earth's surface and takes on the temperature and moisture characteristics of that surface.	p. 9, I B 1	___	___	___
9	E3	Air masses change local weather conditions as they move over Earth's surface.	p. 8-11, I A and I B 2-3	___	___	___
9	E4	Surface air pressures are usually highest in the center of air masses. The Highs on weather maps usually denote the centers of air masses. Highs tend to be fair-weather systems.	p. 9, I B 2	___	___	___
10	E5	Air masses come into contact with one another at boundaries called fronts. Abrupt changes in weather elements often occur across fronts.	p. 10-11, I B 4	___	___	___
10	E6	Low pressure areas form along fronts. Their centers are the Lows marked on weather maps. Lows are the major storm systems of our latitudes.	p. 10-11, I B 4	___	___	___
12	E7	Changes in air pressure are important indicators of passing Highs and Lows.	p. 12, II A 1	___	___	___
13	E8	Weather elements include temperature, humidity, wind direction and speed, air pressure, solar radiation, cloudiness, and precipitation.	p. 13-14, II B	___	___	___
15	E9	The goal of weather forecasting is to make an accurate prediction of future weather. Radar, computers, and weather satellites have helped to improve weather forecasting.	p. 11-12, I C p. 15-16, II C 1-2	___	___	___
15	E10	Abrupt changes in the weather are the exception rather than the rule. Weather tends to change gradually because Highs are large and tend to move and change slowly.	p. 15-16, II C 3	___	___	___
16 18	E11	Substances enter the atmosphere as the result of human activity and natural events. Some of these substances can adversely affect animals, vegetation, or nonliving objects.	p. 16-19, III A-C	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
20	E12	The Sun is the primary source of the energy in the atmosphere.	p. 19-20, IV A 1	___	___	___
21	E13	The uneven distribution of energy in the atmosphere is the cause of weather.	p. 21, IV A 3 and IV B 1-2	___	___	___
21	E14	Cold air is more dense than warm air. As a result, cold air sinks while warm air rises.	p. 21, IV B 3	___	___	___
22	E15	The Highs and Lows that dominate the weather in the United States may move north or south, but their major motion is from west to east.	p. 21-22, IV B 4-6	___	___	___
23 25	E16	Water enters the atmosphere by evaporation and movement out of the leaves of plants. Precipitation returns water to Earth's surface.	p. 23-25, V (all)	___	___	___
23	E17	The higher the temperature, the more water vapor air can hold. When air cools, it can hold less water vapor. Condensation can result, forming clouds, fog, and dew. Precipitation may follow cloud formation.	p. 23, V B 1	___	___	___
25	E18	Hazardous weather conditions can threaten life and property. When people are aware of potentially hazardous weather conditions, they can prepare for and respond to these conditions to save life and property. Hazardous weather conditions include severe thunderstorms, tornadoes, hurricanes, and winter storms.	p. 25-33, VI (all)	___	___	___
33	E19	The climate of a region is the characteristic weather that prevails from season to season and from year to year.	p. 33-34, VII (all)	___	___	___
		BLOCK F ASTRONOMY AND AEROSPACE SCIENCE				
5	F1	The daily motions of the Sun, the Moon, the planets, and the stars across the sky can all be explained by a rotating Earth.	p. 5, I A 1a	___	___	___
6	F2	Earth's rotation in relation to the Sun causes the daily change from daylight to darkness. This daily change occurs everywhere on Earth except within the Arctic and Antarctic Circles.	p. 6, I A 1b	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
6	F3	Earth's rotation causes the length of one day to be about 24 hours.	p. 6, I A 1b	___	___	___
6	F4	Earth makes one revolution around the Sun in about 365 days. This defines the length of one year.	p. 6, I A 2	___	___	___
6	F5	Seasons on Earth are caused by the tilt of Earth's axis of rotation compared to the plane in which Earth orbits the Sun and the revolution of Earth around the Sun.	p. 6-7, I A 3a	___	___	___
7	F6	In summer, the Northern Hemisphere is tilted toward the Sun and the Sun is shining more directly on the Northern Hemisphere.	p. 7-8, I A 3b	___	___	___
7	F7	In winter, the Northern Hemisphere is tilted away from the Sun and the Sun is shining more directly on the Southern Hemisphere than on the Northern Hemisphere.	p. 7-8, I A 3b	___	___	___
8	F8	On the first day of spring and on the first day of fall, neither hemisphere is tilted toward the Sun and the Sun is shining directly on the equator.	p. 7-8, I A 3b	___	___	___
9	F9	At noon in the continental United States, the shadow cast by a vertical pole always points in a northerly direction.	p. 8-10, I A 5-6	___	___	___
12	F10	The Moon travels around Earth as Earth travels around the Sun. As the Moon travels in its orbit, it always has the same side toward Earth.	p. 12-13, I C 1-2	___	___	___
12	F11	The Moon, which produces no light of its own, is seen by reflected light. One half of the Moon's surface is always lighted by the Sun.	p. 12-13, I C 2	___	___	___
12 13	F12	The amount of the lighted side of the Moon's surface observed from Earth determines the phases. At new Moon, the side facing Earth is dark and the Moon cannot be seen. At full Moon, all of the lighted side can be seen.	p. 12-13, I C 2-3	___	___	___
13	F13	Tides are caused by the gravitational attraction between Earth, the Moon, and the Sun. High tides tend to occur when a position on Earth's surface faces directly toward or away from the Moon.	p. 13, I C 4	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
13	F14	Compared to Earth, the Sun is many times larger.	p. 13-14, I D 1	___	___	___
14	F15	The distances between stars are vast.	p. 14, I D 2	___	___	___
15	F16	The Sun and the planets, which revolve around the Sun, are the major bodies in the solar system. Each planet has its own unique characteristics.	p. 15, I E 1	___	___	___
15	F17	Earth is apparently the only planet that supports life.	p. 15, I E 2	___	___	___
15	F18	A meteor is caused by a rock fragment traveling in space that enters and heats in Earth's atmosphere, producing light.	p. 15, I E 3	___	___	___
		BLOCK G ENERGY AND MOTION				
9	G1	Energy is required to do work.	p. 9, II A	___	___	___
9	G2	Some objects have potential or stored energy because of their position.	p. 9, II B 1	___	___	___
10	G3	A moving object has kinetic energy because of its motion.	p. 10, II B 2	___	___	___
10	G4	Objects possess different forms of kinetic and potential energy. Some forms of energy include mechanical, sound, light, heat, electrical, magnetic, chemical, and nuclear energy.	p. 10, II C	___	___	___
10	G5	Energy can be transformed from one kind and form to another, such as chemical energy to heat, light, and/or electrical energy; or heat energy to mechanical and/or light energy; or electrical energy to heat, light, and/or mechanical energy.	p. 10, II D	___	___	___
10	G6	Machines transfer mechanical energy from one object to another.	p. 10-14, III (all)	___	___	___
11	G7	The amount of work done by a machine is always less than the amount of work put into the machine.	p. 10-11, III A	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
11	G8	A machine can be made more efficient by reducing friction. Some common ways of reducing friction include lubricating or waxing surfaces, sanding surfaces to make them smoother, or using ball bearings.	p. 10-11, III A	___	___	___
11	G9	Machines may make work seem "easier." Machines can change the direction or amount of a force or the distance or speed of a force.	p. 11-12, III B	___	___	___
12	G10	Simple machines include the lever and inclined plane.	p. 12-13, III C	___	___	___
14	G11	Sound is produced by vibrating matter.	p. 14-15, IV A-B	___	___	___
15	G12	Sound waves travel only through matter.	p. 15, IV C	___	___	___
15	G13	The speed of sound is very much slower than the speed of light.	p. 15, IV C	___	___	___
16	G14	Loud noise, especially if it is prolonged, can damage an organism's hearing temporarily or permanently.	p. 15-16, IV D	___	___	___
17	G15	Light waves travel away from a source in straight paths.	p. 16-18, V B	___	___	___
17	G16	When light strikes a surface, some light may be reflected, some may be absorbed, and some may be transmitted.	p. 16-18, V B	___	___	___
18	G17	Lenses can be used to form images that may be larger, the same size, or smaller than the object.	p. 16-18, V B	___	___	___
18	G18	Electromagnetic waves have many uses in modern society. Radio waves are used in communication, especially radio and television broadcasting. Microwaves are used in communication and in cooking food. X-rays are used in diagnosing diseases.	p. 16, V A p. 18-19, V C	___	___	___
18	G19	Overexposure to electromagnetic waves may cause harmful effects in humans.	p. 18-19, V C	___	___	___
19	G20	Objects expand when heated and contract when cooled. An exception is water, which expands upon freezing.	p. 19-20, VI A	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
21	G21	Heat flows from warmer objects or regions (those at higher temperatures) to cooler objects or regions (those at lower temperatures). Insulation reduces the flow of heat.	p. 20-22, VI B-D	___	___	___
24	G22	Electrical energy flows through conductors. Most metals are good conductors.	p. 23-26, VII B	___	___	___
24	G23	Some substances, such as rubber and glass, are poor electrical conductors and are called electrical insulators.	p. 23-26, VII B	___	___	___
24	G24	A simple electric circuit consists of a source of electrical energy, an electrical device such as a light bulb, and connecting wires between them.	p. 24-26, VII B 2	___	___	___
27	G25	Electrical energy is dangerous and can injure or kill living organisms.	p. 27, VII D 2	___	___	___
27	G26	Fuses and circuit breakers provide protection from fires that can be caused by overloaded circuits.	p. 27, VII D 2	___	___	___
27	G27	Some electrical devices should be grounded to prevent electrical shock.	p. 27, VII D 2	___	___	___
		BLOCK H THE CHEMISTRY OF MATTER				
-	H1	The natural world, including rocks, water, air, plants, animals, and humans, is made of chemicals.	- -	___	___	___
5	H2	Many household and laboratory chemicals are potentially hazardous, and safe procedures must be followed in using them. Safe procedures must also be followed in handling laboratory equipment.	p. 5-6, I A	___	___	___
9	H3	Many household and laboratory chemicals give off vapors which are toxic or flammable. These substances should be used only in the absence of a flame and in a well-ventilated place.	p. 9, I C	___	___	___
9	H4	Unless directed to do so, chemicals should not be mixed, since they may combine and produce a hazardous substance.	p. 9, I C	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
9	H5	Pressurized containers may explode when punctured or heated. They should be used according to the directions.	p. 9, I C	___	___	___
9	H6	Household chemicals should be kept in a closed storage area out of the reach of small children and pets.	p. 9, I C	___	___	___
9	H7	In our everyday experience, matter is anything that occupies space and has mass.	p. 9-10, II	___	___	___
9	H8	All objects that we know of are composed of one or more elements.	p. 9-10, II	___	___	___
9	H9	Less than half of the elements occur commonly under natural conditions.	p. 9-10, II	___	___	___
9	H10	Atoms of the same element or of different elements can combine. When combined, these atoms are joined by chemical bonds which have chemical energy.	p. 9-10, II	___	___	___
10	H11	All substances have characteristic physical properties.	p. 10-12, II A	___	___	___
10	H12	The phase in which matter exists usually depends upon how close together its particles are and how fast they move.	p. 10-11, II A 1	___	___	___
10	H13	The particles of a solid are relatively close together and are relatively resistant to a change of position. A solid has a definite shape and volume.	p. 10-11, II A 1	___	___	___
11	H14	Usually the particles are farther apart and change position more readily in the liquid phase than in the solid phase.	p. 10-11, II A 1	___	___	___
11	H15	Energy is generally absorbed when a solid liquefies and is generally released when a liquid becomes a solid.	p. 10-11, II A 1	___	___	___
11	H16	The particles in a gas are usually farther apart and change position more readily than the particles in a liquid or a solid.	p. 10-11, II A 1	___	___	___
11	H17	Energy is generally absorbed when a liquid changes into a gas. Energy is generally liberated when a gas condenses into a liquid.	p. 10-11, II A 1	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
11	H18	Most solids turn into liquids at a temperature called the solid's melting point. A liquid changes into a solid at its freezing point, which is usually the same temperature as its melting point.	p. 11, II A 2	___	___	___
12	H19	Liquids turn into gases at a temperature called the liquid's boiling point. Condensation occurs when a gas changes into a liquid.	p. 12, II A 3	___	___	___
12 14	H20	Matter can change chemically and/or physically.	p. 12-16, II B-D	___	___	___
14	H21	Chemical change results in the formation of one or more new substances, each having its own properties by which it is recognized. The properties of the original material can no longer be detected since the original material no longer exists.	p. 14-16, II C-D	___	___	___
12	H22	Physical change alone does not result in the formation of any new substances.	p. 12-14, II B	___	___	___
15	H23	Some chemical changes must be started by energy, in the form of light, heat, or electrical energy. Other chemical changes can start without energy being added.	p. 15, II D 1	___	___	___
15	H24	Some chemical changes release energy as heat, light, or electrical energy. Some chemical changes absorb energy.	p. 15, II D 1	___	___	___
16	H25	The rate of a chemical reaction usually increases as the temperature increases.	p. 15-16, II D 2	___	___	___
16	H26	Substances usually combine faster when their particles are smaller.	p. 15-16, II D 2	___	___	___
		BLOCK I ENERGY: SOURCES AND ISSUES				
11	I1	The calorie is a unit of measure that allows people to compare the amount of energy obtained when substances are used for food or fuel.	p. 11-13, I E	___	___	___
13	I2	The watt is a unit of measure that allows people to compare the rate at which various electrical devices use energy.	p. 11-13, I E	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade		
				7	8	9
13	I3	The consumption of energy to meet human needs has increased over time. As energy consumption increases, the need for sources of fuel to provide energy increases.	p. 13-18, II A	___	___	___
18	I4	Fossil fuels are energy sources formed over millions of years from the remains of dead plants and animals. Some fossil fuels are oil, coal, and natural gas.	p. 18-24, II B 1	___	___	___
19	I5	Gasoline and heating fuel are obtained from oil and are its principal products used for energy.	p. 18-20, II B 1a	___	___	___
21	I6	Natural gas is used primarily to produce heat for industrial needs and for heating and cooking in the home.	p. 20-21, II B 1b	___	___	___
21 24	I7	Plastics, fertilizers, and drugs are products made from fossil fuels.	p. 20-21, II B 1b p. 21-24, II B 1c	___	___	___
24	I8	Coal is used primarily as fuel to produce electrical energy and to provide heat for industrial needs.	p. 21-24, II B 1c	___	___	___
24	I9	The energy of moving water can be used to produce electrical energy.	p. 24-25, II B 2	___	___	___
25	I10	The nuclear energy contained in uranium is used to produce heat, which can in turn be used to produce electrical energy.	p. 25-28, II B 3	___	___	___
28	I11	Because electrical energy can be used to do so many things, it is an integral part of our society; it is used to heat and cool buildings, run machines and appliances, and provide lighting. Electrical energy must be produced from other energy sources, such as fossil fuels, uranium, or falling water.	p. 28-29, II B 4	___	___	___
29	I12	Electrical energy can be transmitted easily through conductors such as wires.	p. 28-29, II B 4	___	___	___
32	I13	Most of the United States energy demand is met currently by the fossil fuels.	p. 29-35, III A-B	___	___	___
38	I14	Proven reserves of coal are much greater than those of oil or natural gas.	p. 35-38, III C	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
36	I15	The environmental problems associated with energy production include air pollution, land and water pollution, thermal pollution, and nuclear energy hazards.	p. 35-38, III C	___	___	___
36	I16	The burning of fossil fuels, especially coal, contributes to air pollution.	p. 35-38, III C	___	___	___
36	I17	Such activities as mining for coal, setting up offshore oil and gas drilling platforms, and transporting fuel by ship may increase pollution on land and water.	p. 35-38, III C	___	___	___
36	I18	The construction of dams and pipelines may alter the ecology of an area.	p. 35-38, III C	___	___	___
37	I19	Nuclear power plants produce hazardous nuclear waste which has to be stored someplace. Resistance to storage and transport of nuclear waste has arisen in many localities.	p. 35-38, III C	___	___	___
41	I20	Conservation is the wise use of energy sources by reducing unnecessary waste and improving efficiency.	p. 40-46, IV A	___	___	___
47	I21	Nonrenewable energy resources are those resources not being replaced during the time span of human history. The fossil fuels and uranium are nonrenewable resources.	p. 46-51, IV B 1	___	___	___
52	I22	Renewable resources are recycled by natural processes within a relatively brief time span. Fresh water, wind, sunshine, and plants are examples of resources that replace themselves over short periods of time.	p. 52-66, IV B 2	___	___	___
52	I23	The Sun is the primary source of energy for Earth.	p. 52-56, IV B 2a	___	___	___
53	I24	The energy of the Sun can be captured and used to provide heat and hot water for homes, offices, and factories.	p. 53-56, IV B 2a(2)	___	___	___
54	I25	Solar energy can also be converted to electrical energy.	p. 53-56, IV B 2a(2)	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
56	I26	Plant matter and animal wastes can be burned to produce heat or can be converted into fuels.	p. 56-58, IV B 2b	___	___	___
58	I27	Wind energy can be used to produce electrical energy.	p. 58-59, IV B 2c	___	___	___
47 52	I28	Use of any nonrenewable or renewable energy source has advantages and disadvantages associated with its use.	p. 47-66, IV B 1-2	___	___	___
		BLOCK J SCIENCE, TECHNOLOGY, AND SOCIETY				
11	J1	Science is the process of solving problems to gain an understanding of the natural world. Scientific knowledge helps humans predict the outcome of events in the natural world.	p. 11-12, I A	___	___	___
11	J2	Technology is the process of using resources, including scientific knowledge, to develop products and/or processes. Technology attempts to solve the problems or meet the needs of the individual or society.	p. 11-12, I A	___	___	___
12	J3	Science and technology help advance one another. Technological devices and processes are often invented or improved based on scientific principles. These new or improved technological processes or devices, in turn, can often be used to discover new scientific principles.	p. 12-13, I B	___	___	___
14	J4	Some technological processes and devices can be viewed as systems which consist of input, processing, output, feedback, and comparison and control.	p. 14, II A	___	___	___
14	J5	A complex technological process or device consists of simpler technological processes or devices working together as a system.	p. 14, II A	___	___	___
15	J6	Everyone interacts with the products of technology in some way.	p. 15-16, II B	___	___	___
15	J7	Every technological process or device affects the environment in some way.	p. 15-16, II B	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
17	J8	Changes in science, technology, or society often affect the other two.	p. 17, III A	___	___	___
17	J9	Refinements and improvements in technological products have resulted in greater numbers and types of products to meet human needs. This greater availability of new products has improved the standard of living and has changed people's lifestyles.	p. 17-18, III B 1-2	___	___	___
18	J10	Science and technology affect business and industry and change employment opportunities.	p. 18-19, III B 3-4	___	___	___
19	J11	Science and technology alone cannot solve society's problems.	p. 19, III B 5-6	___	___	___
20	J12	Use of a technological product may depend on the attitudes of individuals or societies toward it.	p. 19-20, III C	___	___	___
20	J13	The development or use of a technological process or device by one country may have an international or global impact.	p. 20-21, III D	___	___	___
21	J14	People have increased choices in their everyday lives because of the products of technology.	p. 21, IV A	___	___	___
22	J15	Every technological process or device has advantages and disadvantages associated with its use, providing benefits and burdens for people and the environment.	p. 21-22, IV B	___	___	___
22	J16	A particular technological process or device should be assessed by its advantages and disadvantages.	p. 21-22, IV B	___	___	___
22	J17	When a technological process or device is adopted, information should be collected continuously on the short- and long-term benefits for people and the environment, and on the potential adverse consequences for present and future generations and the environment.	p. 21-22, IV B	___	___	___
23	J18	Decisions about a technological process or device should be based on consideration of its short- and long-term consequences.	p. 23, IV C 1	___	___	___

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Syllabus Page Reference		Core Understanding	Page & Syllabus Reference for Supporting Understandings	Checklist for Local Program by Grade 7	8	9
23	J19	A technological process or device may be short-lived or terminated when the disadvantages outweigh the advantages or when a more advantageous technological process or device is developed. Sometimes a technological process or device can be modified to reduce or eliminate its disadvantages.	p. 23, IV C 2	___	___	___
24	J20	Decisionmaking about a complex technological issue usually involves trade-offs (compromise) among alternative courses of action. Trade-offs often are made between the benefits and burdens for people and the environment.	p. 24-25, IV C 3-7 p. 25-26, IV D	___	___	___

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THE STATE EDUCATION DEPARTMENT
ALBANY, NEW YORK 12234

ASSISTANT COMMISSIONER FOR
INSTRUCTIONAL SERVICES
(GENERAL EDUCATION)

DIVISION OF GENERAL EDUCATION
BUREAU OF SCIENCE EDUCATION
518: 474-7748

September 23, 1985

TO: District Superintendents
Superintendents of Public and Nonpublic Schools
Principals of Public and Nonpublic Secondary Schools

FROM: Douglas S. Reynolds, Chief
Bureau of Science Education

SUBJECT: Regents Competency Testing Program in Science

This publication, Information Bulletin: Regents Competency Testing Program in Science, provides information that public and nonpublic schools will need to prepare for the first administration of the Regents competency test in science in June of 1988. It should be reproduced, as needed, for distribution to appropriate administrators and staff in secondary schools which have grades 7, 8, and/or 9.

Informational meetings on the Regents competency testing program in science are planned for late fall and early winter of this academic year throughout the State. A tentative schedule appears on the inside cover. Further details will be provided when the schedule has been finalized. Presentations will also be made during the school year at statewide and regional meetings of professional science education organizations. All meetings and presentations will assist school personnel in planning their science 7, 8, and 9 programs in light of the Regents competency testing program in science.

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Informational Meetings
Regents Competency Testing Program in Science

Region	Meeting Dates*	Contact (Resource Allocation Plan Regional Coordinator)
Western	October 29-31	David Wyler Erie 1 BOCES (716) 686-2071
Northern	November 13-15	David DeSantis Franklin-Essex-Hamilton BOCES (518) 483-6420
Northeastern	November 20-22	Robert Kelly Rensselaer-Columbia-Greene BOCES (518) 477-2635
Midstate	December 4-6	Norman Palin Cortland-Madison BOCES (607) 753-9301
Metro	December 10-13	Thomas Kelly Suffolk 3 BOCES (516) 549-4900
New York City	January 6-24	

* Meetings will be held at several different locations in each region.

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